FIELD SAMPLING PLAN
for EXPANDED SITE INSPECTION

Rico-Argentine
Dolores County, Colorado

CERCLIS ID #COD980952519

U.S. EPA Contract No. 68-W9-0053
Work Assignment No. 19-8JZZ

Prepared By:
Barry Hayhurst and Ron Coringrato

URS Consultants, Inc.
1099 18th Street, Suite 700
Denver, CO 80202-1907

URS DOCUMENT CONTROL NO. 41861.58.30.B1420

Approved: _____ Date: 25 July 95
T. F. Staible, Program Manager, URS

Approved: _____ Date: July 25, 1995
Barry Hayhurst, Site Manager, URS

Approved: _____ Date: July 25, 1995
Ron Coringrato, Site Investigator, URS

Approved: _____ Date: 8/1/95
Greg Oberley, Site Assessment Manager, EPA

ARCS

Remedial Planning Activities
At Selected Uncontrolled
Hazardous Substance Disposal Sites
In The Zone of Regions VI, VII and VIII

Environmental Protection Agency

Contract No. 68-W9-0053

FIELD SAMPLING PLAN for EXPANDED SITE INSPECTION

RICO-ARGENTINE DOLORES COUNTY, COLORADO

Work Assignment No. 19-8JZZ

JULY 25, 1995

URS
CONSULTANTS, INC.

Brown and Caldwell
Harza Environmental Services, Inc.
Shannon & Wilson, Inc.
Western Research Institute

DISTRIBUTION LIST

ENVIRONMENTAL PROTECTION AGENCY

Robert Heise (1 copy)	Work Assignment Manager, ARCS, EPA Region VIII, WA #19-8JZZ
Greg Oberley (3 copies)	Site Assessment Manager, ARCS, EPA Region VIII, WA #19-8JZZ

URS CONSULTANTS, INC.

Barry Hayhurst	Site Manager, ARCS, EPA Region VIII, WA #19-8JZZ
Ron Coringrato	Site Investigator, ARCS, EPA Region VIII, WA #19-8JZZ
File (2 copies)	ARCS, EPA Regions VI, VII, and VIII

FIELD SAMPLING PLAN
for
EXPANDED SITE INSPECTION

Rico-Argentine
Dolores County, Colorado

TABLE OF CONTENTS

		PAGE #
SIGNATURE PAGE		i
DISTRIBUTION LIST		ii
TABLE OF CONTENTS		iii
1.0	INTRODUCTION	1
2.0	OBJECTIVES	2
3.0	BACKGROUND	2
3.1	Site Location	
3.2	Site Description	
3.3	Site History and Previous Work	
3.4	Site Geology	
3.5	Site Hydrogeology	
3.6	Site Hydrology	
3.7	Site Meteorology	
4.0	PRELIMINARY PATHWAY ANALYSIS	8
4.1	Source Characteristics	
4.2	Air Pathway	
4.3	Groundwater Pathway	
4.4	Surface Water Pathway	
4.5	Soil Exposure Pathway	
5.0	FIELD OPERATIONS	13
5.1	Concept Of Operations	
5.2	Sampling Locations	
5.3	Sampling Methods	
5.4	Control of Contaminated Materials	
5.5	Analytical Parameters	
5.6	Field Quality Control Procedures	
5.7	Chain of Custody	
6.0	DATA REDUCTION, VALIDATION AND REPORTING	19

7.0 LIST OF REFERENCES 20

FIGURES

Figure 1 Area of Influence Map
Figure 2 Sample Location Map
Figure 3 Sources, Potential Sources and PPE

TABLES

Table 1 Sample Locations and Rationale
Table 2 Non-Sampling Data Collection Rationale
Table 3 Sample Plan Checklist
Table 4 Sample Container Types, Volumes and Sample Preservatives

1.0 INTRODUCTION

URS Consultants, Inc. (URS) has been tasked by the Region VIII office of the U.S. Environmental Protection Agency (EPA) to conduct an Expanded Site Inspection (ESI) at the Rico-Argentine (R-A) site (CERCLIS ID# COD980952519) in Dolores County, Colorado. This Field Sampling Plan (FSP) has been prepared in support of the ESI activities at the R-A site. Field work for this ESI is projected to be completed in late summer 1995.

This FSP is designed to provide guidance for field operations during the ESI and has been prepared in partial fulfillment of Work Assignment No. 19-8JZZ. The FSI field operations will include both sampling and non-sampling data collection. Sampling procedures will strictly adhere to applicable procedures described in the URS Technical Standard Operating Procedures (TSOPs) for conducting field operations at hazardous waste sites (URS Consultants, Inc. (URS) 1991).

Sample collection will potentially consist of eleven surface water samples and eleven collocated sediment samples, six opportunity surface water and sediment samples, sixteen source samples, seven opportunity soil samples and four groundwater samples. The quality assurance/quality control (QA/QC) samples will follow the requirements of the Region VIII Supplement to the Guidance for Performing Site Inspections under CERCLA and will include four trip blank samples, two surface water duplicate samples, one groundwater duplicate sample, and four rinsate blank samples. Two triple volume samples each for surface water/groundwater and sediment/soil will be collected for the matrix spike/matrix spike duplicate (MS/MSD) and are not considered additional samples. Samples will be analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total metals and cyanide through the EPA Contract Laboratory Program (CLP), Routine Analytical Services (RAS). Groundwater samples will also be analyzed for total dissolved metals through CLP-RAS.

2.0 OBJECTIVES

The purpose of this ESI is to compile data pertinent to the evaluation of the R-A site with regard to the EPA's Hazard Ranking System (HRS) criteria. The specific objectives of this ESI are to:

- Utilize non-sampling data (i.e, previous reports, aerial photographs, personal communication) and field observations to identify the presence of potential sources of contamination at the site;
- Identify and delineate receptor targets for the surface water and groundwater pathways;
- Determine resident populations subject to contamination via the soil exposure pathway;
- Document potential releases of site contaminants to users of groundwater from the alluvial aquifer; and
- Document potential releases of site contaminants to targets along the surface water pathway.

3.0 BACKGROUND

3.1 SITE LOCATION

The R-A site encompasses approximately 75 acres of settling ponds and tailings piles near the east end of Dolores County in the Rico Mountains of southwestern Colorado (Figure 1). Mining operations on a total of approximately 2,500 acres have been consolidated under one ownership (U.S. Environmental Protection Agency (EPA) 1984). The legal description for the R-A site is the southeast quarter of Section 25, T. 40 N, R. 11 W. The approximate site coordinates are 37° 42′ 05" North latitude and 108° 01′ 39" West longitude. The R-A site can be reached by proceeding south from Telluride, Colorado, on State Highway 145 over Lizard Head Pass to Rico or by proceeding north from Cortez on State Highway 145 to Rico.

3.2 SITE DESCRIPTION

The R-A site is an inactive mining operation located in portions of two drainages, Silver Creek and the Dolores River, which converge within the town of Rico (figures 1 and 2). The St. Louis Tunnel adit, approximately 15 settling ponds, an inactive sulfuric acid plant and two cyanide heap leach basins are located adjacent to and east of the Dolores River, approximately one-half to three-quarters of a mile north of Rico. The Rico-Argentine Mill, Blaine Tunnel and two large tailings piles are located adjacent to Silver Creek, approximately one mile northeast of the town of Rico (Figure 2) (U.S. Geological Survey (USGS) 1960). Water from the underground mine workings associated with the R-A site drains from the mine to the St. Louis Tunnel Adit, where it flows into the interconnected settling ponds prior to discharging into the Dolores River (URS 1995).

The R-A complex has had a National Pollutant Discharge Elimination System (NPDES) permit (#CO-0029793) for this discharge system since 1976 but has frequently been in violation of permit standards (U.S. Environmental Protection Agency, Water Management Division (EPA) 1994). The discharge is now regulated under the Colorado Pollutant Discharge Elimination System (CPDES). The NPDES permit compliance point is Outfall 002, the discharge from settling pond number 5 to the Dolores River, approximately one quarter mile north of Rico. Outfall 001, previously the discharge from Blaine Tunnel into Silver Creek (an emergency bypass discharge point) no longer exists. A barrier was constructed in 1990 which routed the flow from the Blaine Tunnel to the St. Louis Tunnel which empties into the settling ponds. The St. Louis Tunnel is now the sole source for the permit. The permit limits the discharge to a 30-day average flow of 2.6 million gallons per day (EPA 1994; CDPH&E 1995).

The Rico area has been heavily mined and several potential sources of contaminants, primarily settling ponds and tailings piles, are located adjacent to Silver Creek and the Dolores River in and downstream of Rico (URS 1995) (Figure 2). The exact history of these potential additional sources is unknown at this time. The R-A region is primarily Bureau of Land Management (BLM) property located within the San Juan National Forest with surrounding peaks reaching 14,000 feet above mean sea level (msl) and summits in the Rico Mountains more than 12,000 feet above msl. The town of Rico and

the Dolores River settling ponds are at 8,800 feet above msl and the Silver Creek operations at 9,200 feet above msl (USGS 1960).

3.3 SITE HISTORY AND PREVIOUS WORK

The Rico, Colorado, area has a long mining history, a detailed account of which can be found in the Site Inspection Prioritization Report (URS 1994). Early mining activities in the Rico area began with prospecting attempts in 1861. By the late 1860s, several claims were staked at the confluence of the Dolores River and Silver Creek and the Rico area became known as the Pioneer District. Silver production fluctuated reaching a peak in 1893. By 1895, exploration and production activity decreased due to the silver panic of 1893 and exhaustion of the major ore bodies. In 1902, all of the important mines in the district were consolidated under the United Rico Mine Company which began production of base-metal ores. Beginning in the late 1800s base-metal ores began to out-produce silver ores in the Rico District. The Rico-Argentine Mining Company was formed in 1915 and quickly became a major producer of base-metal ores in the Pioneer District. A custom mill was built in 1926 by the International Smelting Company, a subsidiary of Anaconda Mining Company. Base-metal production peaked in 1927 but by 1928 the mill had shut down and by 1932 all mining in the area had ceased (USGS 1974).

The Rico-Argentine Mining Company resumed sporadic mining activities in 1934 and steady production in 1939 (State of Colorado, Department of Natural Resources, Bureau of Mines (BOM) 1939a; BOM 1939b). A sulfuric acid plant, located north of the settling ponds along the Dolores River, was operated between 1955 and 1964 (USGS 1974). All mining operations ceased in 1971 and most of the mine workings were allowed to flood and drain through the St. Louis Tunnel (BOM 1971).

The Rico-Argentine Mining Company built a 300-foot by 500-foot leach pad next to the old sulfuric acid plant in 1973. A cyanide solution was used to leach silver and gold from raw ore, and an overflow of an unknown quantity of leaching liquor to the Dolores River was documented in approximately 1974 (BOM 1974). In 1975 an additional

cyanide leach pad was constructed in a settling pond originally used by the acid plant (BOM 1975).

The Rico-Argentine Mine properties were purchased by Anaconda Copper Company (Anaconda), a subsidiary of the Atlantic Richfield Corporation (ARCO) in 1980. Anaconda carried out several environmental efforts such as building a water treatment plant at the St. Louis Tunnel discharge, capping wells, plugging adits and stabilizing tailings and treatment ponds (Anaconda Minerals Company (AMC) 1994; WMD 1994).

The Rico-Argentine Mining Company was issued a Notice of Violation (NOV) and a Cease and Desist Order (CDO) by the Colorado Department of Health Water Quality Control Division in 1980 because it failed to meet the compliance conditions of its NPDES permit (EPA 1994). As a result of the NOV and CDO Anaconda began treating the discharge from the St. Louis Tunnel with slaked lime (EPA 1994).

The R-A site was first brought to the EPA's attention in 1984 by the Colorado Department of Health. Surface water and sediment samples from Silver Creek and the Dolores River were collected during a site inspection conducted for the EPA in November 1984. Surface water samples were analyzed for total metals, dissolved metals and cyanide. Sediment samples were analyzed for total metals. The analytical results indicated that surface water and sediment samples contained elevated concentrations of arsenic, cadmium, copper, iron, lead, manganese and zinc. Cyanide was not detected in surface water samples; however, the holding times of the cyanide samples had been exceeded (Ecology and Environment, Inc. (E&E) 1985).

Anaconda sold its holdings in the property to Rico Development Corporation in 1988 (State of Colorado Department of Public Health and the Environment (CDPHE) 1988). A NOV and a CDO were issued to Rico Development Corporation in May of 1990 for violations of its NPDES permit of lead and silver standards, in June of 1993 for violations of the silver standards, and in January of 1994 for violations of the silver, lead, cadmium zinc and total suspended solids standards (EPA 1994; CDPHE 1993). Rico Development Corporation paid a $15,000 fine in 1994 for the 1990 NOV/COD.

The U.S. Department of Interior, Bureau of Reclamation (BOR) conducted surface water and sediment sampling in the Dolores River and its tributaries between 1989 and 1993. The sample data show Silver Creek to be the major, but not the only, source of mercury and other heavy metals in the upper Dolores River Basin (U.S. Department of the Interior, Bureau of Reclamation (BOR) undated).

The ARCO which acquired Anaconda in 1976, has initiated a voluntary environmental site characterization of the town of Rico and surrounding area within the framework of the Colorado Voluntary Cleanup and Redevelopment Act. Field work in early June 1995 included residential soil sampling, background soil sampling, mine-waste sampling (to evaluate the viability of revegetation as a remedial option for mine waste materials), sampling of seeps and adit discharges, sampling settling pond waters and sediments and sampling groundwater. ARCO plans to submit a draft application for voluntary cleanup in September 1995. ARCO did not collect surface water or sediment samples from Silver Creek or the Dolores River during the 1995 sampling event (PTI Environmental Services and ESA Consultants 1995).

3.4 SITE GEOLOGY

Detailed information about the geology of the Rico, Colorado, area can be found in "Geology and Ore Deposits of the Rico District, Colorado" by Edwin T. McKnight (USGS 1974). The geology of the Rico District is extremely complex with the dominant structure of the district a faulted dome centered on a monzonite stock. Sedimentary strata exposed in the area are the Ouray and Leadville limestones, overlain by the Hermosa Formation, whose limestone beds are the source of the district's massive sulfide ore deposits. The youngest sedimentary strata in the Rico District are the red beds of the Cutler Formation. The lower slopes of the Rico District are generally covered by debris resulting from wash, talus and landslide processes (USGS 1974). Surface materials in the valley sides and bottom at the R-A site are largely glacial or stream deposits (URS 1995).

3.5 SITE HYDROGEOLOGY

The glacial and stream deposits and the wash, talus and landslide debris which covers the valley sides and bottoms form a shallow unconfined aquifer. Hydraulic conductivity is assumed to be high at approximately 10^{-2} centimeters per second (cm/s)(U.S. Geological Survey 1983). The general direction of groundwater flow in the Rico area is estimated to follow the stream beds of Silver Creek and the Dolores River (EPA 1984). Groundwater in the shallow unconfined aquifer leaves mineral deposits in well screens and pipes which render water delivery systems unusable within a few years (State of Colorado Department of Transportation (CDOT) 1994).

Deeper bedrock aquifers are found at the site. Several exploratory drill holes along the Dolores River portion of the site flowed water and were capped (AMC 1988; AMC 1994). Several geothermal springs are found along the Dolores River, between the settling ponds and the town of Rico. One of the geothermal springs is used as a bathing pool by local residents (Jahnke 1994; URS 1995). Carbonate and iron oxide deposits are evident in the area between the settling ponds and the town of Rico (URS 1995).

3.6 SITE HYDROLOGY

The R-A site is located in the Dolores River Basin. The Dolores River and its Silver Creek tributary are the major surface water bodies in the R-A site area. The Dolores River flows to the south past the St. Louis Tunnel Adit, the old sulfuric acid plant, the cyanide heap leach basins, and numerous tailings piles and settling ponds (USGS 1960). Silver Creek flows to the southwest and is the source of the town of Rico's drinking water. The drinking water diversion on Silver Creek is located upstream of the RA mill workings and tailings piles (Figure 2) (URS 1995).

Silver Creek flows through the town of Rico over additional tailings before joining the Dolores River on the western edge of Rico. Flow rate data for Silver Creek has not been located. Flow rate data is available from a gauging station on the Dolores River, approximately four miles below Rico. At this station the 41-year annual mean flow rate

is 136 cubic feet per second (cfs) and the upstream drainage basin encompasses 105 square miles (USGS 1993).

3.7 SITE METEOROLOGY

The R-A site is located in a semiarid climate zone. The mean annual precipitation, as totaled from the University of Delaware (UD) database, is 12.8 inches. The net annual precipitation as calculated from precipitation and evapotranspiration data obtained from the UD is 4.1 inches (University of Delaware (UD) 1986). The 2-year, 24-hour rainfall event for the site is approximately 1.5 inches (Dunne and Leopold 1978).

4.0 PRELIMINARY PATHWAY ANALYSIS

4.1 SOURCE CHARACTERISTICS

Source areas at the R-A site include an estimated 75 acres of tailings piles and settling ponds along both the Dolores River and Silver Creek. An unknown quantity of tailings have been moved into the town of Rico for use as road cover and backfill material for minor construction; however, it is not known if this material was from R-A site source areas (Small 1995). The St. Louis Tunnel discharge (NPDES #CO-0029793) is also considered a source (EPA 1994).

Tailings which are source areas at the R-A site are estimated to contain approximately 400,000 tons of material (EPA 1984). A number of sampling efforts have been conducted at the site, primarily focusing on surface water and sediment sampling of the Dolores River and Silver Creek. These include an Anaconda (ARCO) contractor from 1980 through 1983, EPA-sponsored sampling in 1984, BOR sampling from 1989 through 1993 and the recent sampling conducted by an ARCO contractor in June 1995. The sampling event in June 1995 included the collection of samples from potential sources at the site; however, the analytical results for these samples are not available at this time.

Based on reports in EPA, CDPHE and BOR files and observations made during the site reconnaissance, source areas at the R-A site, including the tailings piles, tailings ponds and settling ponds, are uncontained with respect to the air, groundwater, surface water and soil exposure pathways. The two cyanide heap leach pads that were built did incorporate Hypalon liners and overflow berms but these have not been maintained and a historic release of leaching liquor from one of the leach pads occurred in 1974 (BOM 1974; BOM 1975; WMD 1994). In addition, empty 55-gallon drums are scattered throughout the R-A mill area. The contents, if any, of the drums is unknown and no sample results have been located (URS 1995). It is reasonable to assume that potential contaminants at the site would include solvents or other organic compounds associated with mining and milling activities.

4.2 AIR PATHWAY

Approximately 92 people live in the town of Rico and 123 residents are listed in the U.S. Census Bureau's Rico division which is within the four-mile target distance limit (U.S. Department of Commerce (USDOC), Bureau of the Census 1990). The Rico area is experiencing population expansion due to growth in nearby Telluride. State highway 145 is paved through the center of Rico but all side and residential streets are unpaved dirt and gravel. Anecdotal evidence suggests that tailings have been used as fill material in minor construction such a road and culvert repair in Rico which would mean that all 92 residents of Rico may live on a source area. From U.S. Geological Survey topographic maps, the portion of Rico that appears to still have houses covers approximately two square miles or 1,280 acres (USGS 1960).

The federally-listed Bald eagle (*Haliaeetus leucocephalus*) (endangered), Peregrine Falcon (*Falco peregrinus*) (endangered), Mexican Spotted Owl (*Strix occidentalis lucida*) (threatened), Southwestern Willow Flycatcher (*Empidonox trailli extimus*) (proposed endangered), and Black-footed Ferret (*Mustela Nigripes*) (endangered) potentially inhabit the area (U.S. Department of the Interior, Fish and Wildlife Service (USFW) 1994a; USFW 1994b). Federal candidate species North American Wolverine (*Gulo gulo luscus*), Northern Goshawk (*Accipiter gentilis*), Black Tern (*Chlidonias niger*), Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*), Roundtail Chub (*Gila robusta jordani*),

and Flannelmouth Sucker (*Catostomus latipinnis*) may also inhabit the Rico area (USFW 1994a; USFW 1994b). Federal records of threatened and endangered species in the area are based in part on actual sitings.

4.3 GROUNDWATER PATHWAY

Three wells, listed as household use by the Colorado State Engineer, are located within four miles of the site (State of Colorado, Office of the State Engineer (CSE) 1994). Two of these wells are located approximately one-half mile upgradient of the St. Louis Tunnel Adit and its associated sources on the Dolores River. According to the owner of one of these wells, no water quality problems have been encountered since drilling the well for a drinking water source in 1990 (Jahnke 1994). The well log for this well indicates that the total depth of the well is 160 feet below ground surface and the well is screened in the alluvial aquifer (CSE 1995).

The third domestic well is at the south end of the town of Rico, approximately one and one-half miles downgradient of the source areas and below the confluence of Silver Creek and the Dolores River (CSE 1994; USGS 1960). A total of approximately six people use these wells, possibly for drinking water (Jahnke 1994; USDOC 1990). Flowing hot springs are located adjacent to the lowest settling ponds at the R-A mine site and some of the water from one of the hot springs is gravity piped to a hot tub located approximately 25 feet from the settling pond where it is utilized by residents of Rico for bathing purposes (Jahnke 1994; URS 1995). This hot spring has not been sampled but flow was estimated to be less than 5,000 gallons per day (CDHPE 1994).

4.4 SURFACE WATER PATHWAY

The town of Rico obtains 100 percent of its municipal drinking water from a diversion on Silver Creek above potential impacts from R-A mining operations (Figure 2). The water is treated through infiltration galleries and chlorinated (E&E 1984). No wetlands were identified on Silver Creek downstream of the R-A mill site (USFW 1994c). The Colorado Division of Wildlife (CDOW) has stocked native Cutthroat Trout in Silver Creek approximately two miles above Rico, and the population is doing relatively well.

Brook Trout may potentially be present in sections of Silver Creek; however, the mining activities along Silver Creek have impacted the aquatic life downstream of the site (Colorado Division of Wildlife (CDOW) 1994; CDOW 1995). Iron staining of the streambed is evident (URS 1995). Silver Creek flows adjacent to and south of the R-A mill area and tailings piles. The tailings piles are not contained and the creek appears to flow over portions of the tailings inside the city limits of Rico. Sampling conducted by the BOR determined that Silver Creek is a major source of mercury and other heavy metals in the upper Dolores River basin (BOR undated). The source of the mercury has not been identified.

Surface water, from the settling ponds located adjacent to the Dolores River, discharges directly into the Dolores River. The Dolores River, in and downstream of Rico, is posted with signs by the CDOW designating "open fishing" on the river (URS 1995). The CDOW stocks the Dolores River upstream of Rico with Rainbow Trout, Cutthroat Trout and Brown Trout. Production figures for the Dolores River are not available (CDOW 1995). The Dolores River is not used as a source of municipal drinking water; however, there are 12 listed diversions within 15 downstream miles of the R-A site. The St. Louis Tunnel is the only diversion with domestic use listed; however, it is doubtful that any domestic use actually occurs from this source. The other surface water diversions are used for irrigation, stockwatering, industrial, recreation, fire and other purposes (CSE 1994).

National Wetland Inventory maps for the area indicate that approximately 2.4 frontage miles of palustrine emergent and scrub-shrub wetlands are present along the Dolores River within 15 downstream miles of the site (USFW 1994). A significant community of montane riparian forest (*Populous augustifolia-Picea pungens/Alnus incana*) is reported to be present on the east bank of the Dolores River within four miles of the site. This natural community is ranked rare to uncommon both globally and in Colorado (Colorado Natural Heritage Program (CNHP) 1994). Federally listed aquatic species that potentially present in the Dolores River include the Colorado Squawfish (*Ptychocheilus*), the Humpback Chub (*Gila cypha*), the Bonytail Chub (*Gila elegans*) and the Razorback Sucker (*Xyrauchen texanus*). Federal candidate species include the Flannelmouth Sucker

(*Catostomus latipinnis*), the Roundtail Chub (*Gila robusta jordani*) and the Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*) (USFW 1994a; USFW 1994b).

Iron-stained cobbles are present in both Silver Creek and the Dolores River and material from tailings piles is sloughing into both streams (URS 1995). Surface water and sediment sampling of the Dolores River and Silver Creek in 1984 and sampling by the Bureau of Reclamation between 1989 and 1993 indicated elevated concentrations of manganese in surface water and elevated concentrations of arsenic, cadmium, copper, iron, lead, manganese, mercury and zinc in the sediment samples. During sampling activities in 1984, leachate from tailings ponds located adjacent to Silver Creek was observed to be entering Silver Creek (E&E 1985). In addition, there have been numerous and continuing permit violations of the cadmium, lead, silver and zinc discharge limits for the R-A settling pond discharge point to the Dolores River.

4.5 SOIL EXPOSURE PATHWAY

Material from tailings piles in the vicinity of Rico has reportedly been used in Rico as gravel road cover and as backfill around culverts and underground water pipes throughout the town (Small 1995). The quantity and the exact years this practice was used are unknown. However, tailings were used to backfill around the underground water pipes from at least 1976 to approximately 1979. The use of tailings for backfill purposes ceased when it was suspected that the tailings were deteriorating the cast iron water pipes (Small 1995; Swank 1995). It is not known if the tailings used for these purposes were from sources associated with the R-A site (Small 1995).

Based on census data for the town of Rico, the Rico division and Dolores County, approximately 123 people potentially reside on, or live within 200 feet of, contaminated soil areas (USDOC 1990; USGS 1960). Access roads leading to mine adits, mills, tailings and ponds are posted with "No Trespassing" signs; however, access to sources at the site is not restricted with fences (URS 1995). Most of the mining properties in the R-A region were originally patented and are now on private property with approximately 2,500 acres combined under one ownership. The R-A area is situated within the San Juan National Forest with small public land parcels mixed within the private mining

properties. The area receives high recreational use including fishing, hunting, hiking and camping (URS 1994; URS 1995).

The endangered Bald Eagle, Black-footed Ferret and Peregrine Falcon may utilize the R-A area. The proposed endangered Southwestern Willow Flycatcher and threatened Mexican Spotted Owl may also be present in the Rico area (USFW 1994a; USFW 1994b). The federal candidate species North American Wolverine, Black Tern and Northern Goshawk may utilize the site area as habitat (USFW 1994a; USFW 1994b). Several montane riparian sensitive communities are also found in the area (CNHP 1994).

5.0 FIELD OPERATIONS

5.1 CONCEPT OF OPERATIONS

5.1.1 Schedule

Field operations at the R-A site are scheduled for the week of September 11 through 15, 1995. Non-sampling data collection will be performed as appropriate to fulfill the objectives of the ESI.

5.1.2 Safety

Site-related activities are expected to be accomplished in Level D personal protective equipment. Personal protective equipment levels will be upgraded to Level C if appropriate. All field activities will be conducted in strict accordance with an approved Site Health and Safety Plan, which will be developed prior to commencement of field activities.

5.1.3 Site Access

URS will obtain access to the R-A site. The assistance of the EPA Region VIII Site Assessment Manager will be requested if needed. URS will obtain access

to off-site properties as needed. Signed access agreements will be obtained from all property owners prior to the commencement of sampling activities.

5.2 SAMPLING LOCATIONS

The ESI field activities will involve the collection of a maximum of seventy-two samples including sixteen source samples, eleven collocated surface water and sediment samples, six collocated opportunity surface water and sediment samples, four groundwater samples, seven opportunity soil samples and eleven QA/QC samples. Table 1 identifies proposed sample locations and describes the rationale for the collection of each sample. Figure 2 illustrates the proposed sample locations. Exact sample locations may be revised in the field based upon site-specific observations and the prevailing conditions encountered during fieldwork.

Source samples to be collected for the ESI will include two samples from the abandoned cyanide leach pits, two samples from the tailings piles at the mill on Silver Creek, one sample from the tailings piles at the confluence of Silver Creek and the Dolores River in the town of Rico, one sample from the tailings pile just south of town along the east bank of the Dolores River and one from the tailings pile which is bisected by the Dolores River one mile south of Rico. One opportunity soil sample will be collected from the tailings piles at the mill on Silver Creek in the vicinity of the empty 55-gallon drums if stained soils are observed. In addition, three collocated water and sediment source samples will be collected from the settling ponds along the Dolores River. These samples will be collected from the uppermost settling pond, the lowermost settling pond near the outfall into the Dolores River and from a ditch which appears to collect leachate from the upper settling pond area. One source sample will be collected from the outfall of the St. Louis Tunnel to characterize the mine discharge.

Eleven collocated surface water and sediment samples will be collected from Silver Creek and the Dolores River and six opportunity surface water and sediment samples may potentially be collected from tributaries to the Dolores River. One background location will be sampled on each of Silver Creek and the Dolores River. The Dolores River background location will be located approximately one quarter mile north of the

settling ponds. The background location on Silver Creek will be from above the mill site at the Rico municipal water intake. A second location will be sampled from Silver Creek downstream of the mill area. A third sample will be collected from Silver Creek in the town of Rico before it enters the Dolores River to determine the contribution of the tailings pile in the town of Rico to Silver Creek and to determine Silver Creek's total contribution to contamination in the Dolores River. Seven locations to test for impacts to targets will be sampled on the Dolores River. The target sample location farthest upstream will be just below the confluence of the leachate collection ditch which separates the upper settling ponds from the Dolores River. A second location will be sampled just below the outfall of the settling ponds into the Dolores River. The third Dolores River target location will be sampled at the confluence with Silver Creek, 1.1 miles downstream of the Probable Point of Entry (PPE) of the settling pond discharge to the Dolores River. The fourth and fifth locations will be located just below the two major tailings piles located along the Dolores River, 1.7 and 1.9 miles downstream of the PPE respectively. The sixth Dolores River target location will be sampled in wetlands adjacent to the Rico park, approximately two miles south of Rico and 2.8 miles downstream of the PPE. The seventh collocated surface water and sediment location will be sampled from forested wetlands just upstream from the gauging station at Montelbres Bridge at approximately 5.3 miles downstream from the PPE.

Tributaries to the Dolores River will be visually inspected and field screened for indications of potential contamination (iron staining and/or low pH). If visual evidence or field screening indicates that a tributary may potentially be contributing contamination to the Dolores River, opportunity surface water and sediment samples will be collected from the tributary at its confluence with the Dolores River. Flow rates of the Dolores River, Silver Creek and tributaries to the Dolores River will be measured or estimated.

Five groundwater samples will be collected during this ESI. A background groundwater sample will be collected from a well in the Dolores River valley upstream of the R-A properties. One groundwater sample will be collected from the public use geothermal spring and one from a domestic well on the south side of Rico. Provisions are also

included to take two opportunity samples if springs or seeps are identified during field sampling activities.

Seven opportunity residential soil samples (one of which will be a background) will also be collected from yards in the town of Rico. URS will interview residents and work with Rico's maintenance coordinator to identify potential tailings used as fill material. Information about the use of tailings as fill material is anecdotal and will require field research to verify.

5.3 SAMPLING METHODS

One member of each field sampling crew will record all site conditions, weather, equipment, decontamination procedures, precise sample locations and pertinent sampling information in a field logbook. Samples will be collected in containers and preserved in accordance with URS TSOP Section 4.2, "Sample Containers, Preservation and Maximum Holding Times." Sample container types, volumes and preservatives are presented in Table 4. Decontamination procedures for all non-disposable sampling equipment will be conducted in accordance with URS TSOP Section 4.11, "Equipment Decontamination." All sample locations will be photographed and documented in accordance with URS TSOP Section 4.5, "Sample Location and Documentation." Media specific sampling procedures are described in the following sections (URS 1991).

5.3.1 Surface Water Sampling

Surface water sampling will be performed in accordance with TSOP Section 4.18, "Surface Water Sampling" (URS 1991). Surface water samples will be collected by immersing the sample container directly into the water body. If conditions exist such that surface water samples cannot be collected in this manner (e.g., low water flow rate), the surface water samples will be collected using a Teflon® scoop. The field team will measure the pH, temperature and specific conductance of each sample collected. Sampling will be conducted from the farthest downstream location to the farthest upstream location in order to minimize the potential for cross-contamination. At each location the surface

water sample will be collected prior to collecting the sediment sample, and the surface water flow rate will be measured or estimated.

5.3.2 Sediment Sampling

Sediment sampling will be performed in accordance with URS TSOP Section 4.17, "Sediment Sampling" (URS 1991). Proposed sediment sampling locations are indicated in Figure 2 and the rationale for each sample is presented in Table 1. Sediment samples will be collected using stainless steel spoons or scoops. A decontaminated rod will be attached to the scoops for sampling at deeper locations. Sediment sampling will be conducted from the farthest downstream location to the farthest upstream location to minimize the potential for cross-contamination. Sediment samples at each location will be collected immediately following collection of the collocated surface water sample.

5.3.3 Groundwater Sampling

Groundwater sampling will be conducted according to URS TSOP Section 4.12 "Groundwater Sampling." The well will be purged prior to collecting groundwater samples. Field parameters (temperature, pH and conductivity) will be measured every half casing volume or at appropriate regular intervals if the casing volume or holding tank volume is not known. Field parameters will be measured according to URS TSOP 4.14 "Water Sample Field Measurements" (URS 1991). Groundwater samples will be collected after a minimum of three well casing volumes have been purged and field parameters (temperature and conductivity) vary less than 10 percent and pH varies less than 0.2 pH units over three consecutive measurements.

5.3.4 Soil Sampling

Soil sampling will be conducted according to URS TSOP 4.16 "Surface and Shallow Depth Soil Sampling" (URS 1991). A stainless steel hand auger or stainless steel spoon will be used for soil sample collection. All soil samples will

be collected as biased grab samples from surface soil. At each soil sampling location, soil will be collected from the zero- to two-foot depth interval, homogenized (except for samples to be analyzed for VOCs) in a stainless steel bowl using a stainless steel spoon, and then transferred to the appropriate sample containers as specified by URS TSOP Section 4.2, "Sample Containers, Preservation and Maximum Holding Times."

5.3.5 Source Sampling

Source samples from each media type (surface water, sediment, groundwater and soil) will be collected in accordance with the media specific sampling procedures described above.

5.4 CONTROL OF CONTAMINATED MATERIALS

Investigation-derived waste (IDW) generated during this ESI may include decontamination fluids and disposable personal protective equipment. IDW will be managed in accordance with procedures outlined in the Office of Emergency Remedial Response (OERR) Directive 9345.3-02 (EPA 1991). Disposal of contained wastes will be performed under subcontract if necessary.

5.5 ANALYTICAL PARAMETERS

Field and analytical parameters for each sample are presented in Table 3. All surface water, sediment and soil samples collected for this ESI will be analyzed for VOCs, SVOCs, total metals and cyanide through CLP-RAS.

5.6 FIELD QUALITY CONTROL PROCEDURES

All samples will be collected, handled and preserved as described in URS TSOP Section 4.2, "Sample Containers, Preservation and Maximum Holding Times" (URS 1991). Surface water and sediment sampling will be conducted from the farthest downstream sampling location and progress upstream. All non-disposable sampling equipment will

be initially decontaminated prior to beginning sampling and again following collection of each sample as described in URS TSOP Section 4.11, "Equipment Decontamination." Basic decontamination procedures will consist of removal of gross particulates with a scrub brush and potable water, a Liquinox® soap and water solution wash, a deionized water rinse, a methanol rinse and a final deionized water rinse (URS 1991).

5.7 CHAIN OF CUSTODY

As each sample is collected, the sample will be labeled in accordance with URS TSOP Section 4.4, "Sample Identification and Labeling," and the appropriate sample information will be recorded on an EPA Chain-of-Custody form in accordance with URS TSOP Section 4.3, "Chain-of-Custody and Sample Tracking" (URS 1991).

6.0 DATA REDUCTION, VALIDATION AND REPORTING

Within five working days of the completion of all field activities and demobilization from the site, URS will prepare a Sampling Activities Report (SAR) describing all sampling activities, actual sample locations and field observations. The SAR will conform to the Region VIII supplement to the Guidance for Performing Site Inspections under CERCLA, Interim final, September 1992.

An Analytical Results Report (ARR) will be submitted within 10 weeks of the receipt of the last validated Sample Delivery Group (SDG). Data validation will be conducted by the Environmental Services Division of the Region VIII EPA. The ARR will conform to the Region VIII Supplement to the Guidance for Performing Site Inspections under CERCLA, September 1992.

7.0 LIST OF REFERENCES

Anaconda Minerals Company (AMC). 1988. Letter from Robert L. Dent, Anaconda Minerals Company, Minerals Environmental Manager, to James B. Horn, Colorado Department of Health, Water Quality control Division, District Engineer. August 28, 1988.

Anaconda Minerals Company (AMC). 1994. Personal communication with Bob Dent, Minerals Environmental Manager. May 20, 1994.

Colorado Natural Heritage Program (CNHP). 1994. State species of concern listing prepared by Katherine E. Pague, Information Manager. April 25, 1994.

Dunne, Thomas and Luna B. Leopold. 1978. "Water in Environmental Planning." W. H. Freeman and Company, San Francisco.

Ecology and Environment, Inc. (E&E). 1984. Site Visit Report, Rico-Argentine Mine, Rico, Colorado. Prepared by Meg Babits. October 18, 1984.

Ecology and Environment, Inc. (E&E). 1985. Analytical Results for Rico-Argentine Mine, Rico, Colorado. Prepared by Meg Babits. July 29, 1985.

Jahnke, Mary. 1994. Personal communication with Mary Jahnke, local resident. May 18, 1994.

Office of the Federal Register. 1990. National Archives and Records Administration. December 14, 1990, Code of Federal Regulation (CFR) 40, Part 300, "Hazard Ranking System (HRS) for Uncontrolled Hazardous Substance Releases." Appendix A of the National Oil and Hazardous Substances Release Contingency Plan; Final Rule, pp. 55 FR51537-51667.

PTI Environmental Services and ESA Consultants. 1995. Field Guidance Document: Rico Mine District, Dolores County, Colorado.

Small, Bob. 1995. Personal communication with Bob Small, Mayor of Rico, Colorado, on May 16, 1995.

State of Colorado, Department of Public Health and the Environment (CDPHE). 1988. Application for Transfer and Acceptance of Terms of a Colorado Permit. July 26, 1988.

State of Colorado, Department of Health, Water Quality Control Commission (CDPHE). 1993. Classifications and Numeric Standards for San Juan River and Dolores River Basins. Effective October 30, 1993.

State of Colorado, Department of Health, Water Quality Control Division (CDPHE). 1994. Geothermal spring at Rico Development Corp. Memo by Jess Vann. August 19, 1994.

State of Colorado, Department of Public Health and Environment (CDPHE). 1995. Review of NPDES Permit file and CDPS Permit No. CO-0029793.

State of Colorado, Department of Natural Resources, Bureau of Mines (BOM). 1939a. Inspectors Report prepared by District No. 4 State Mine Inspector D. C. McNaughton. April 15, 1939.

State of Colorado, Department of Natural Resources, Bureau of Mines (BOM). 1939b. Report to Bureau of Mines. March 18, 1939.

State of Colorado, Department of Natural Resources, Bureau of Mines (BOM). 1971. Information Report by District No. 4 Inspector. June 10, 1971.

State of Colorado, Department of Natural Resources, Bureau of Mines (BOM). 1974. Information Report by District No. 4 Metal Mining Inspector Thomas D. High. December 5, 1974.

State of Colorado, Department of Natural Resources, Bureau of Mines (BOM). 1975. Information Report by District No. 4 Metal Mining Inspector Thomas D. High. July 17, 1975.

State of Colorado, Department of Natural Resources, Division of Wildlife (CDOW). 1995. Personal communication with Mike Japhet, Fisheries Biologist, on May 23, 1995.

State of Colorado, Department of Transportation (CDOT). 1994. Personal communication with Ted Vickers. May 18, 1994.

State of Colorado, Office of the State Engineer (CSE). 1994. Colorado Wells, Applications, and Permits and Water Rights Report. April 6, 1994.

State of Colorado, Office of the State Engineer (CSE). 1995. Well logs for groundwater wells in the Rico area.

Swank, Dennis. 1995. Personal communication with Dennis Swank, resident of Rico, Colorado, on June 9, 1995.

U.S. Department of Commerce (USDOC), Bureau of the Census. 1990. Summary, Population and Housing Characteristics for Dolores County, Tables 6 and 14.

U.S. Department of the Interior, Bureau of Reclamation (BOR). Undated. Dolores River Basin Water Quality Study.

U.S. Department of the Interior, Fish and Wildlife Service (USFW). 1994a. Federal list of threatened and endangered species in the Rico area. Provided by Keith L. Rose, Assistant Field Supervisor, Grand Junction, Colorado. May 26, 1994.

U.S. Department of the Interior, Fish and Wildlife Service (USFW). 1994b. Federal list of threatened and endangered species in the Rico area. Provided by LeRoy W. Carlson, Colorado Field Supervisor. June 17, 1994.

U.S. Department of the Interior, Fish and Wildlife Service (USFW). 1994c. National wetlands inventory maps for Rico, Colorado, Orphan Butte, Colorado; and Wallace Ranch, Colorado.

U.S. Environmental Protection Agency (EPA). 1984. Potential Hazardous Waste Site - Site Inspection Report, Form 2070-13. Prepared by Margaret Babits, EPA Field Investigation Team, Ecology and Environment, Inc. November 14, 1984.

U.S. Environmental Protection Agency (EPA). 1991. Office of Emergency and Remedial Response, "Management of Investigation-Derived Wastes During Site Inspections OERR 9345.3-02."

U.S. Environmental Protection Agency, Water Management Division (EPA). 1994. Review of Enforcement Files. May 26, 1994.

U.S. Geological Survey (USGS). 1960. 7.5-Minute Series Topographic Quadrangle, Rico, Colorado. (Photoinspected 1975).

U.S. Geological Survey (USGS). 1974. Professional Paper 723 "Geology and Ore Deposits of the Rico District, Colorado" by Edwin T. McKnight.

U.S. Geological Survey (USGS). 1982. 1:100,000-Scale Topographic Map of Dove Creek, Colorado.

U.S. Geological Survey (USGS). 1983. Water Supply Paper 2220 "Basic Groundwater Hydrology" by Ralph C. Health.

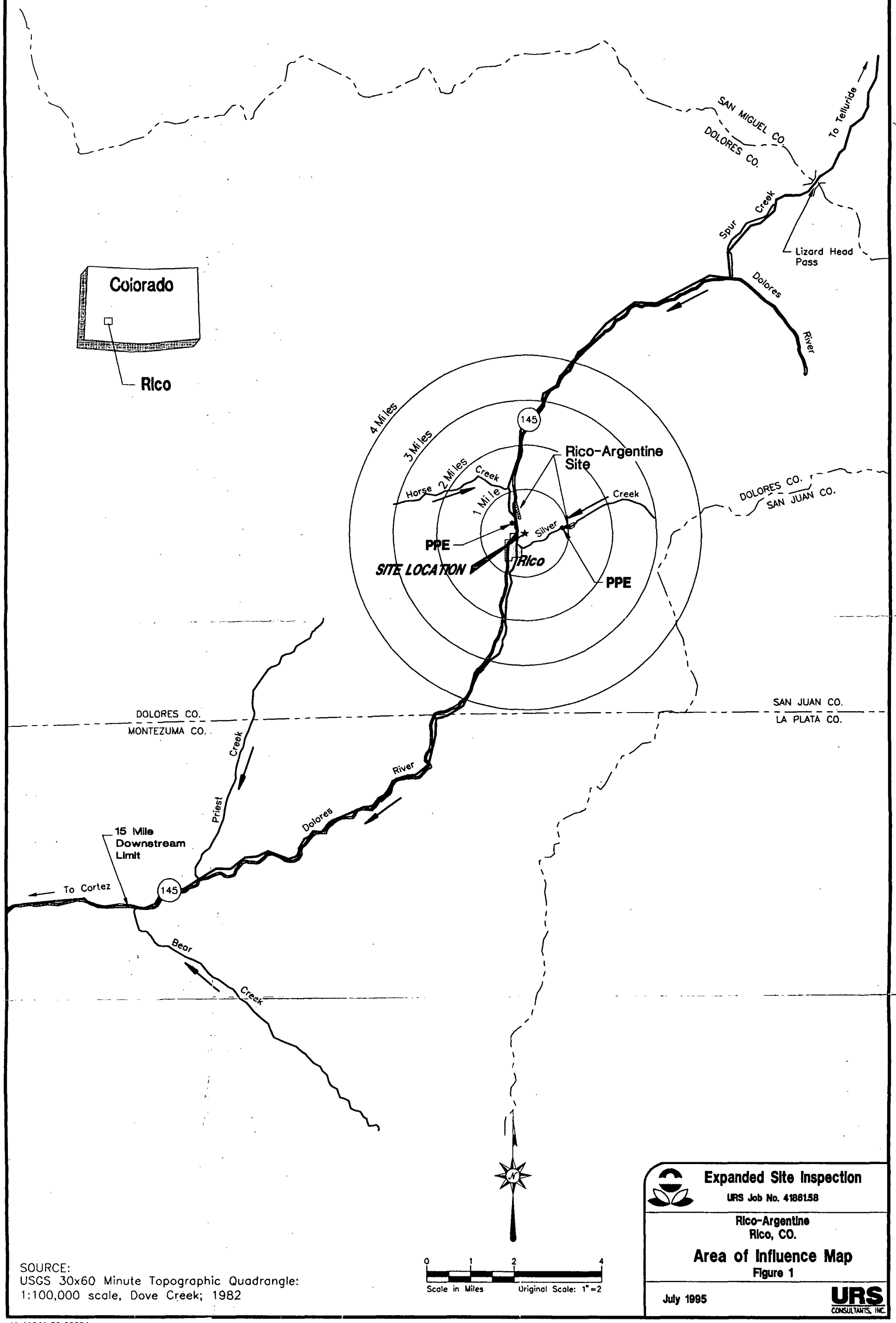
U.S. Geological Survey (USGS). 1993. Water-Data Report CO-93-2, "Water Resources Data, Colorado Water Year 1993, Volume 2, Colorado River Basin."

University of Delaware, Center for Climate Research, Department of Geography (UD). 1986. Terrestrial Water Budget Data Archive; Version 1.01, compiled by C. J. Willmott and C. M. Rowe.

URS Consultants, Inc. (URS). 1991. Technical Standard Operating Procedures (TSOPs) manual for field operations at hazardous waste sites.

URS Consultants, Inc. (URS). 1994. Site Inspection Prioritization, Rico-Argentine, Rico, Colorado, by Michael V. Carr.

URS Consultants, Inc. (URS). 1995. Site reconnaissance of Rico, Colorado, area by R. Coringrato and B. Hayhurst on June 1 and 2, 1995.



SOURCE:
USGS 30x60 Minute Topographic Quadrangle:
1:100,000 scale, Dove Creek; 1982

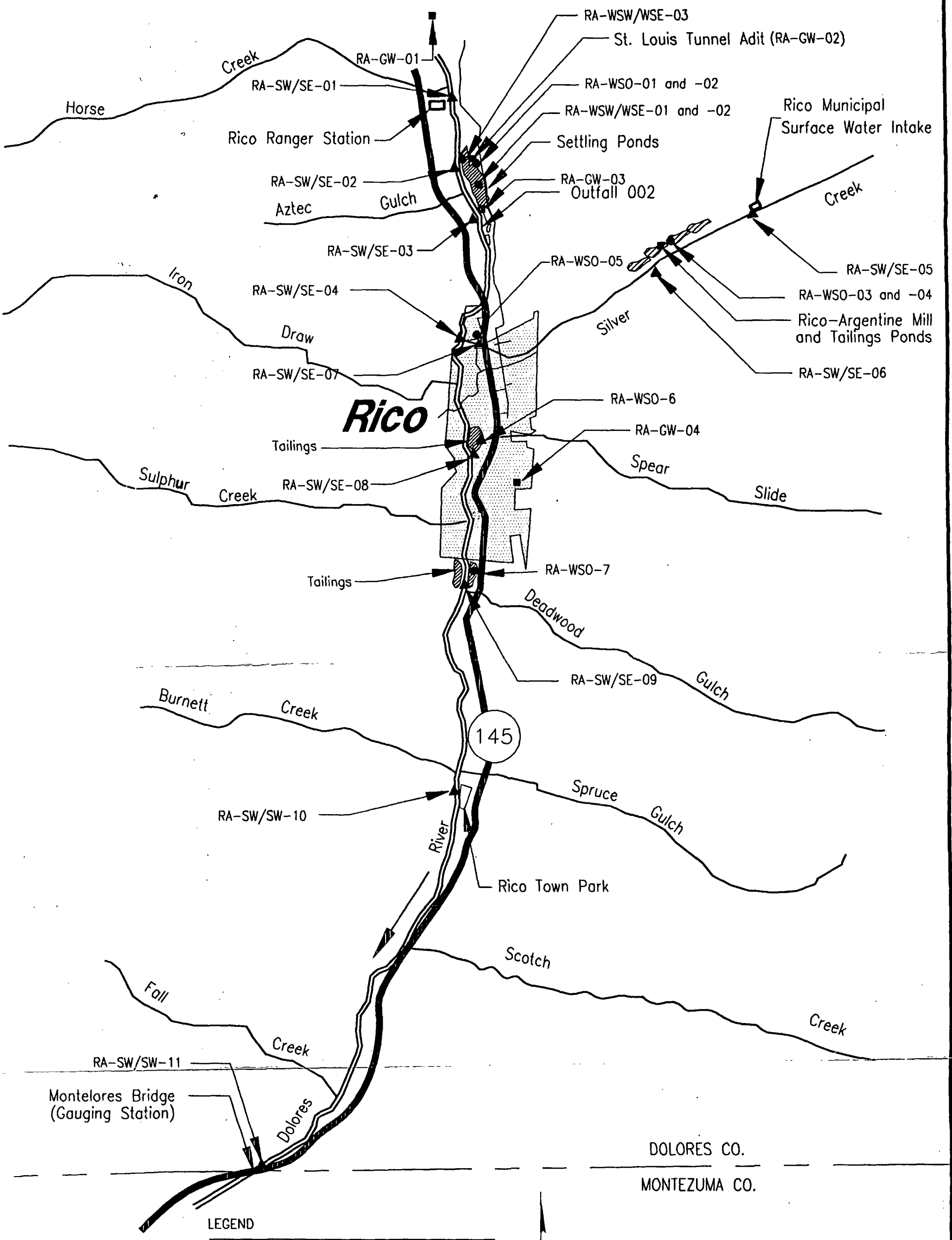
Expanded Site Inspection
URS Job No. 41861.58

Rico-Argentine
Rico, CO.

Area of Influence Map
Figure 1

July 1995

URS CONSULTANTS, INC.



SOURCE:
USGS 7.5 Minute Series Topographic Quadrangle:
Rico, Colorado, 1960

Expanded Site Inspection
URS Job No. 41881.58

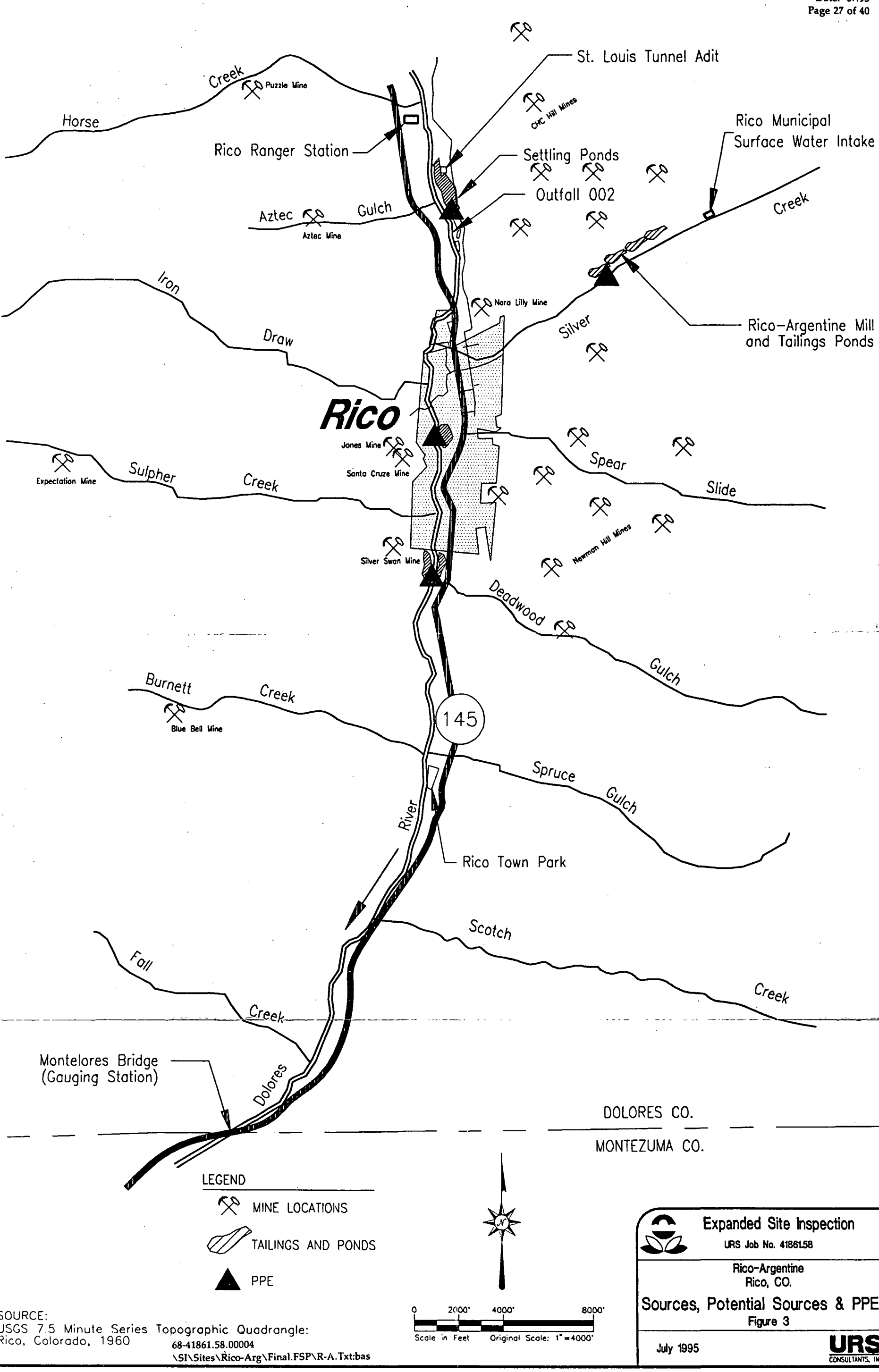
Rico-Argentine
Rico, CO.

Sample Location Map
Figure 2

July 1995

URS CONSULTANTS, INC.

caaaz/arcs/rico/fig2.dwg jtr 7/25/95 14:43



SOURCE:
USGS 7.5 Minute Series Topographic Quadrangle:
Rico, Colorado, 1960

68-41861.58.00004
\SI\Sites\Rico-Arg\Final.FSP\R-A.Txt:bas

Expanded Site Inspection
URS Job No. 41861.58

Rico-Argentine
Rico, CO.

Sources, Potential Sources & PPE
Figure 3

July 1995

URS CONSULTANTS, INC.

...Sites\Rico\fig3.dwg jtr 7/20/95 12:02

TABLE 1
Sample Locations and Rationale

Sample Matrix	Sample ID	Location	Rationale
Surface Water	RA-SW-01	Upstream of site influences on the Dolores River.	Establish background conditions on the Dolores River.
	RA-SW-02	Adjacent to tailings piles on the Dolores River.	Test for impacted fishery.
	RA-SW-03	Confluence of drainage from settling ponds and the Dolores River.	Test for impacted fishery.
	RA-SW-04	Confluence of Silver Creek and the Dolores River.	Test for impacted fishery.
	RA-SW-05	Upstream of site influences on Silver Creek.	Establish background conditions on Silver Creek.
	RA-SW-06	Downstream of tailings piles on Silver Creek.	Test for impacted fishery.
	RA-SW-07	Silver Creek, downstream of tailings pile in town of Rico.	Test for impacted fishery.
	RA-SW-08	1.7 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SW-09	1.9 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SW-10	2.8 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SW-11	5.3 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SW-12	Opportunity sample; field-located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.

TABLE 1
Sample Locations and Rationale
(continued)

Sample Matrix	Sample ID	Location	Rationale
Surface Water (continued)	RA-SW-13	Opportunity sample; field-located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SW-14	Opportunity sample; field-located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SW-15	Opportunity sample; field-located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SW-16	Opportunity sample; field-located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SW-17	Opportunity sample; field-located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
Sediment	RA-SE-01	Upstream of site influences on the Dolores River.	Establish background conditions on the Dolores River.
	RA-SE-02	Adjacent to tailings piles on the Dolores River.	Test for impacted fishery.
	RA-SE-03	Confluence of drainage from settling ponds and the Dolores River.	Test for impacted fishery.
	RA-SE-04	Confluence of Silver Creek and the Dolores River.	Test for impacted fishery.
	RA-SE-05	Upstream of site influences on Silver Creek.	Establish background conditions on Silver Creek.
	RA-SE-06	Downstream of tailings pile on Silver Creek.	Test for impacted fishery.
	RA-SE-07	Silver Creek, downstream of tailings pile in the town of Rico.	Test for impacted fishery.
	RA-SE-08	1.7 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.

TABLE 1
Sample Locations and Rationale
(continued)

Sample Matrix	Sample ID	Location	Rationale
Sediment (continued)	RA-SE-09	1.9 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SE-10	2.8 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SE-11	5.3 miles downstream of Outfall 002 on the Dolores River.	Test for impacted fishery and/or segment of impacted wetlands downstream of Outfall 002.
	RA-SE-12	Opportunity sample; field located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SE-13	Opportunity sample; field located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SE-14	Opportunity sample; field located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SE-15	Opportunity sample; field located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SE-16	Opportunity sample; field located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
	RA-SE-17	Opportunity sample; field located on tributary to the Dolores River	Establish conditions in tributary to the Dolores River.
Surface Soil	RA-SO-01	Sample from off-site location, outside of site influences.	Establish background soil conditions.
	RA-SO-02	Opportunity soil sample from residential property in Rico.	Establish contaminated soil source area.

TABLE 1
Sample Locations and Rationale
(continued)

Sample Matrix	Sample ID	Location	Rationale
Surface Soil (continued)	RA-SO-03	Opportunity soil sample from residential property in Rico.	Establish contaminated soil source area.
	RA-SO-04	Opportunity soil sample from residential property in Rico.	Establish contaminated soil source area.
	RA-SO-05	Opportunity soil sample from residential property in Rico.	Establish contaminated soil source area.
	RA-SO-06	Opportunity soil sample from residential property in Rico.	Establish contaminated soil source area.
	RA-SO-07	Opportunity soil sample from residential property in Rico.	Establish contaminated soil source area.
Groundwater	RA-GW-01	Groundwater sample from upgradient well in the Dolores River Valley.	Establish background conditions in same aquifer as downgradient groundwater sample.
	RA-GW-02	Groundwater sample from downgradient domestic well.	Test for impact to groundwater targets
	RA-GW-03	Opportunity groundwater sample.	Test for impact to groundwater targets.
	RA-GW-04	Opportunity groundwater sample.	Test for impact to groundwater targets.
Source Characterization	RA-WSO-01	Soil sample from abandoned cyanide leach pits along the Dolores River.	Characterize cyanide leach pits.
	RA-WSO-02	Soil sample from abandoned cyanide leach pits along the Dolores River.	Characterize cyanide leach pits.
	RA-WSO-03	Tailings piles along Silver Creek.	Characterize tailings piles.
	RA-WSO-04	Tailings piles along Silver Creek.	Characterize tailings piles.

TABLE 1
Sample Locations and Rationale
(continued)

Sample Matrix	Sample ID	Location	Rationale
Source Characterization (continued)	RA-WSO-05	Tailings pile at confluence of Silver Creek and the Dolores River.	Characterize tailings pile.
	RA-WSO-06	Tailings pile along the Dolores River, south of Rico.	Characterize tailings pile.
	RA-WSO-07	Tailings along the Dolores River, one mile south of Rico.	Characterize tailings pile.
	RA-WSO-08	Opportunity soil sample from soil in the vicinity of 55-gallon drums at the mill site.	Characterize former contents of empty 55-gallon drums.
	RA-WSW-01	Aqueous sample from uppermost settling pond adjacent to the Dolores River.	Characterize contents of settling pond.
	RA-WSW-02	Aqueous sample from lowermost settling pond adjacent to the Dolores River.	Characterize contents of settling pond.
	RA-WSW-03	Aqueous sample from ditch adjacent to upper settling ponds along the Dolores River.	Characterize contents of ditch.
	RA-WSE-01	Sediment sample from uppermost settling pond adjacent to the Dolores River.	Characterize contents of settling pond.
	RA-WSE-02	Sediment sample from lowermost settling pond adjacent to the Dolores River.	Characterize contents of settling pond.
	RA-WSE-03	Sediment sample from ditch adjacent to upper settling ponds along the Dolores River.	Characterize contents of ditch.

TABLE 1
Sample Locations and Rationale
(continued)

Sample Matrix	Sample ID	Location	Rationale
Source Characterization (continued)	RA-WGW-01	Source sample from the outfall of the St. Louis Tunnel.	Characterize mine discharge from St. Louis Tunnel.
	RA-WGW-02	Surface water sample from geothermal spring adjacent to settling pond.	Characterize public use geothermal spring.
QA/QC	RA-SW-18	VOA Trip Blank Sample	Document contamination introduced during sample handling and shipping.
	RA-SW-19	VOA Trip Blank Sample	Document contamination introduced during sample handling and shipping.
	RA-SW-20	VOA Trip blank Sample	Document contamination introduced during sample handling and shipping.
	RA-SW-21	VOA Trip blank Sample	Document contamination introduced during sample handling and shipping.
	RA-SW-22	Rinsate Blank Sample	Document thoroughness of decontamination procedures on soil sampling equipment
	RA-SW-23	Rinsate Blank Sample	Document thoroughness of decontamination procedures on soil sampling equipment
	RA-SW-24	Rinsate Blank Sample	Document thoroughness of decontamination procedures on sediment sampling equipment.
	RA-SW-25	Rinsate Blank Sample	Document thoroughness of decontamination procedures on soil sampling equipment.
	RA-SW-26	Duplicate of RA-SW-04	Determine the precision of sample collection procedures and laboratory analyses.
	RA-SW-27	Duplicate of RA-SW-12	Determine the precision of sample collection procedures and laboratory analyses.
	RA-GW-06	Duplicate of RA-GW-03	Determine the precision of sample collection procedures and laboratory analyses.

TABLE 2
Non-Sampling Data Collection Rationale

Data Element	Data Collection Strategy and Rationale
Source Characterization	Obtain physical dimensions of settling ponds and tailings piles and estimate or measure the flow rate of the drainage from the St. Louis Tunnel. Identify the presence of seeps into Silver Creek and the Dolores River. Visibly identify extent of tailings used as road cover in the town of Rico.
Air Pathway	Observe if contaminants at the site are becoming airborne and available for migration via the air pathway.
Surface Water Pathway	Document presence, type and size of wetlands along Silver Creek and the Dolores River within 15 miles downstream of the site. Document the presence of a montane riparian forest within 15 miles downstream of the site. Document evidence of fishery use on the Dolores River. Measure or estimate flow rates for Silver Creek, tributaries to the Dolores River, and the outfall from the geothermal spring. Document additional potential sources and identify PPEs to surface water bodies.
Groundwater Pathway	Identify if undocumented groundwater wells are present downgradient of the site.
Soil Exposure Pathway	Identify residences, schools or day care centers which may potentially be located within 200 feet of areas of observed contamination.

TABLE 3
Sample Plan Checklist

Site Name: Rico-Argentine

Field Team Leader: B. Hayhurst

City: Rico County: Dolores

Sample Location	Sample Type	Field Parameters			Laboratory Parameters						QA/QC			
		Temp	pH	Cond	VOC	SVOC	Pest/ PCB	Dissolved Metals	Total Metals	Cyanide	Split	Dup.	Spike	Blank
RA-SW-01	Surface Water	X	X	X	X	X	X		X	X			X	
RA-SW-02	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-03	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-04	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-05	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-06	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-07	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-08	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-09	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-10	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-11	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-12	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-13	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-14	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-15	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-16	Surface Water	X	X	X	X	X	X		X	X				

TABLE 3
Sample Plan Checklist
(continued)

Site Name: Rico-Argentine Field Team Leader: B. Hayhurst

City: Rico County: Dolores

Sample Location	Sample Type	Field Parameters			Laboratory Parameters						QA/QC			
		Temp	pH	Cond	VOC	SVOC	Pest/ PCB	Dissolved Metals	Total Metals	Cyanide	Split	Dup.	Spike	Blank
RA-SW-17	Surface Water	X	X	X	X	X	X		X	X				
RA-SW-18	Trip Blank				X									X
RA-SW-19	Trip Blank				X									X
RA-SW-20	Trip Blank				X									X
RA-SW-21	Trip Blank				X									X
RA-SW-22	Rinsate Blank				X	X	X		X	X				X
RA-SW-23	Rinsate Blank				X	X	X		X	X				X
RA-SW-24	Rinsate Blank				X	X	X		X	X				X
RA-SW-25	Rinsate Blank				X	X	X		X	X				X
RA-SW-26	Surface Water	X	X	X	X	X	X		X	X		X		
RA-SW-27	Surface Water	X	X	X	X	X	X		X	X		X		
RA-SE-01	Sediment				X	X	X		X	X			X	
RA-SE-02	Sediment				X	X	X		X	X				
RA-SE-03	Sediment				X	X	X		X	X				
RA-SE-04	Sediment				X	X	X		X	X				
RA-SE-05	Sediment				X	X	X		X	X				

TABLE 3
Sample Plan Checklist
(continued)

Site Name: Rico-Argentine

Field Team Leader: B. Hayhurst

City: Rico County: Dolores

Sample Location	Sample Type	Field Parameters			Laboratory Parameters						QA/QC			
		Temp	pH	Cond	VOC	SVOC	Pest/ PCB	Dissolved Metals	Total Metals	Cyanide	Split	Dup.	Spike	Blank
RA-SE-06	Sediment				X	X	X		X	X				
RA-SE-07	Sediment				X	X	X		X	X				
RA-SE-08	Sediment				X	X	X		X	X				
RA-SE-09	Sediment				X	X	X		X	X				
RA-SE-10	Sediment				X	X	X		X	X				
RA-SE-11	Sediment				X	X	X		X	X				
RA-SE-12	Sediment				X	X	X		X	X				
RA-SE-13	Sediment				X	X	X		X	X				
RA-SE-14	Sediment				X	X	X		X	X				
RA-SE-15	Sediment				X	X	X		X	X				
RA-SE-16	Sediment				X	X	X		X	X				
RA-SE-17	Sediment				X	X	X		X	X				
RA-SO-01	Soil				X	X	X		X	X				
RA-SO-02	Soil				X	X	X		X	X				
RA-SO-03	Soil				X	X	X		X	X				
RA-SO-04	Soil				X	X	X		X	X				

TABLE 3
Sample Plan Checklist
(continued)

Site Name: Rico-Argentine

Field Team Leader: B. Hayhurst

City: Rico County: Dolores

Sample Location	Sample Type	Field Parameters			Laboratory Parameters						QA/QC			
		Temp	pH	Cond	VOC	SVOC	Pest/ PCB	Dissolved Metals	Total Metals	Cyanide	Split	Dup.	Spike	Blank
RA-SO-05	Soil				X	X	X		X	X				
RA-SO-06	Soil				X	X	X		X	X				
RA-SO-07	Soil				X	X	X		X	X				
RA-GW-01	Groundwater	X	X	X	X	X	X	X	X	X				
RA-GW-02	Groundwater	X	X	X	X	X	X	X	X	X				
RA-GW-03	Groundwater	X	X	X	X	X	X	X	X	X				
RA-GW-04	Groundwater	X	X	X	X	X	X	X	X	X				
RA-GW-06	Groundwater	X	X	X	X	X	X	X	X	X		X		
RA-WSO-01	Soil				X	X	X		X	X				
RA-WSO-02	Soil				X	X	X		X	X				
RA-WSO-03	Soil				X	X	X		X	X				
RA-WSO-04	Soil				X	X	X		X	X				
RA-WSO-05	Soil				X	X	X		X	X				
RA-WSO-06	Soil				X	X	X		X	X				
RA-WSO-07	Soil				X	X	X		X	X				
RA-WSO-08	Soil				X	X	X		X	X				

TABLE 3
Sample Plan Checklist
(continued)

Site Name: Rico-Argentine

Field Team Leader: B. Hayhurst

City: Rico County: Dolores

Sample Location	Sample Type	Field Parameters			Laboratory Parameters						QA/QC			
		Temp	pH	Cond	VOC	SVOC	Pest/ PCB	Dissolved Metals	Total Metals	Cyanide	Split	Dup.	Spike	Blank
RA-WSW-01	Surface Water	X	X	X	X	X	X		X	X				
RA-WSW-02	Surface Water	X	X	X	X	X	X		X	X				
RA-WSW-03	Surface Water	X	X	X	X	X	X		X	X				
RA-WSE-01	Sediment				X	X			X	X				
RA-WSE-02	Sediment				X	X	X		X	X				
RA-WSE-03	Sediment				X	X	X		X	X				
RA-WGW-01	Source	X	X	X	X	X	X	X	X	X				
RA-WGW-02	Source	X	X	X	X	X	X	X	X	X				

TABLE 4
Sample Container Types, Volumes and Sample Preservatives

Sample Matrix	Laboratory Parameters						Sample Container Type	Sample Container Volume	Preservative
	VOC	SVOC	Pest/PCB	Total Metals	Dissolved Metals	Cyanide			
Surface Water	X						Glass (Amber)	2 x 40 ml	Cool to 4°C
Surface Water		X					Glass (Amber)	2 x 1-liter	Cool to 4°C
Surface Water			X				Glass (Amber)	2 x 1 liter	Cool to 4° C
Surface Water				X			Polyethylene	1 x 1-liter	Nitric Acid (pH<2)
Surface Water						X	Polyethylene	1 x 1-liter	Sodium Hydroxide (pH>12)
Groundwater					X		Polyethylene	1 x 1-liter	Nitric Acid (pH<2)
Soil/Sediment	X						Glass	1 x 4 oz.	Cool to 4°C
Soil/Sediment		X					Glass	1 x 8 oz.	Cool to 4°C
Soil/Sediment			X				Glass	1 x 8 oz.	Cool to 4° C
Soil/Sediment				X			Polyethylene	1 x 250 ml	Cool to 4°C
Soil/Sediment						X	Polyethylene	1 x 250 ml	Cool to 4°C